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Fine Needle Aspiration Cytology in the Assessment of Head and Neck Neoplasms

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Abstract

Background: Head and neck neoplastic lesions represent a heterogeneous group of benign and malignant tumors that require early and accurate diagnosis for optimal management. Fine Needle Aspiration Cytology (FNAC) has established itself as a rapid, cost-effective, and minimally invasive diagnostic tool in evaluating these lesions.

Aim: To diagnose neoplastic lesions of the head and neck using FNAC and to determine the incidence rates of various lesion types in a tertiary care setting.

Material and Methods: This retrospective observational study was conducted over a one-year period and included 98 patients who presented with clinically or radiologically suspected neoplastic lesions of the head and neck. FNAC was performed using standard techniques, and

cytological diagnoses were categorized and analyzed based on anatomical location, age distribution, and lesion type.

Results: The most commonly affected site was the lymph nodes (38.8%), followed by salivary glands (22.4%), soft tissues (17.3%), thyroid (16.3%), and skin (5.1%). Among lymph node lesions, metastatic squamous cell carcinoma was predominant (52.6%). Papillary carcinoma was the most frequent thyroid neoplasm (56.3%), while pleomorphic adenoma was the leading salivary gland lesion (68.2%). Soft tissue lesions were mostly lipomas (94.1%), and squamous cell carcinoma was the most common skin neoplasm (80%).

Conclusion: FNAC remains a cornerstone in the diagnosis of head and neck neoplasms due to its high diagnostic yield, simplicity, and ability to guide further management. The findings emphasize the continued relevance of FNAC in differentiating between various neoplastic entities and facilitating early intervention in head and neck tumors.

Keywords: FNAC, head and neck neoplasms, cytology

Introduction

Neoplastic lesions of the head and neck region encompass a wide array of benign and malignant tumors affecting structures such as lymph nodes, salivary glands, thyroid, and soft tissues. The anatomical complexity of this region, combined with the diversity of neoplastic entities, poses significant diagnostic challenges for clinicians and pathologists alike. Early and accurate diagnosis is essential to improve prognosis, guide treatment planning, and reduce patient morbidity, especially in regions where these lesions are prevalent due to environmental, genetic, and lifestyle factors [1–3].

Fine Needle Aspiration Cytology (FNAC) has emerged as a frontline diagnostic technique due to its minimally invasive nature, cost-effectiveness, and high diagnostic accuracy. It enables rapid preliminary categorization of lesions as benign or malignant and can often narrow down the

specific neoplastic subtype [4]. FNAC also plays a pivotal role in avoiding unnecessary surgical interventions and facilitates timely initiation of appropriate therapy [5].

Globally, the burden of head and neck tumors is increasing, particularly in low- and middle-income countries where tobacco usage, alcohol consumption, viral infections like HPV and EBV, and occupational exposures are prominent etiological factors [6,7]. In India, these tumors constitute one of the most common cancer groups in both men and women, making early diagnosis through techniques like FNAC indispensable [8].

Numerous studies have validated the role of FNAC in differentiating reactive, inflammatory, and neoplastic conditions, with sensitivity ranging between 80–98% and specificity up to 100% in some series [9]. Despite limitations such as inadequate sampling or poorly differentiated tumors, FNAC continues to be a preferred method in both primary care and tertiary settings due to its reproducibility, low complication rate, and ability to sample deep or difficult-to-access regions using image guidance [10].

Given this context, the present study was undertaken with the aim **to diagnose neoplastic lesions of the head and neck using FNAC** and **to determine the incidence rate of various head and neck neoplasms** in a tertiary care setting. This evaluation is expected to reinforce the clinical utility of FNAC and provide updated epidemiological insights into the distribution of neoplastic lesions in this anatomically complex region.

Material and Methods

This retrospective observational study was conducted in the Department of Cytopathology at a tertiary care teaching hospital over a period of one year. The study included **98 patients** who presented with palpable or clinically suspicious neoplastic lesions in the head and neck region and were subjected to fine needle aspiration cytology (FNAC) for diagnostic evaluation.

Inclusion Criteria

- All patients of any age or gender presenting with swellings or lesions in the head and neck region who underwent FNAC.
- Lesions suspected to be neoplastic based on clinical or radiological examination.

Exclusion Criteria

- Inadequate or non-diagnostic FNAC smears.
- Patients with purely inflammatory or non-neoplastic lesions.
- Patients who underwent FNAC for non-head and neck sites.

Procedure

FNAC was performed using a 22–24 gauge needle attached to a 10 ml disposable syringe. Aspiration was carried out under aseptic precautions. In cases of deeper lesions, ultrasound-guided FNAC was performed. Multiple passes were made if necessary to ensure sufficient cellular yield. The aspirated material was smeared onto glass slides, air-dried for Giemsa staining, and alcohol-fixed for Papanicolaou staining. Special stains such as Ziehl–Neelsen or PAS were employed where necessary. The cytological diagnosis was categorized as:

- **Benign neoplastic**
- **Malignant neoplastic**
- **Suspicious for malignancy**
- **Others** (if not classifiable)

All smears were reviewed by two independent cytopathologists to ensure diagnostic accuracy. Clinical correlation and, where available, histopathological follow-up were used to confirm cytological diagnoses.

Data Analysis

The data was entered into Microsoft Excel and analyzed using descriptive statistics. The frequency and percentage of various neoplastic lesions were calculated to determine their incidence and distribution across age, gender, and anatomical site.

Results

Table 1 shows the overall incidence of various neoplastic lesions in the head and neck region. Lymph node lesions were the most frequently encountered, accounting for 38.8% of the total 98 cases. This was followed by salivary gland lesions (22.4%), soft tissue lesions (17.3%), thyroid lesions (16.3%), and skin lesions (5.1%).

Table 2 presents the age-wise distribution of different neoplastic lesions. The highest number of cases was observed in the 51–60 years age group (19 cases), followed by 31–40 years (21 cases) and 41–50 years (16 cases). Lymph node lesions were most common in the 51–60 age group, while salivary gland lesions were notably frequent in individuals aged 31–40 years.

Table 3 details the various lymph node lesions identified in the study. Metastatic squamous cell carcinoma was the predominant lesion, representing 52.6% of all lymph node cases. Other significant findings included metastatic poorly differentiated carcinoma (15.8%), Non-Hodgkin's lymphoma (10.5%), metastatic adenocarcinoma (10.5%), and smaller proportions of Hodgkin's lymphoma (5.3%) and metastatic nasopharyngeal carcinoma (5.3%).

Table 4 describes the types of thyroid lesions observed among the 16 patients. Papillary carcinoma was the most common thyroid neoplasm, found in 56.3% of the cases. Follicular neoplasms

accounted for 31.3%, while medullary carcinoma and follicular lesion of undetermined significance were seen in 6.3% each.

Table 5 outlines the distribution of salivary gland neoplasms. Pleomorphic adenoma was the predominant entity, comprising 68.2% of cases, followed by mucoepidermoid carcinoma (22.7%). Warthin's tumor and adenocarcinoma were identified in 4.5% of cases each.

Table 6 highlights the composition of soft tissue lesions. Lipomas constituted the vast majority (94.1%) of cases, with benign spindle cell lesions comprising a minority (5.9%).

Table 7 depicts the skin lesions encountered in the study. Squamous cell carcinoma was the most common skin tumor (80%), while benign skin adnexal tumors were observed in 20% of the cases.

Table 1: Incidence of Different Neoplastic Head and Neck Lesions (n=98)

Lesions	Total Cases	Incidence Rate (%)
Lymph node lesions	38	38.8%
Thyroid Lesions	16	16.3%
Salivary Gland lesions	22	22.4%
Soft tissue lesions	17	17.3%
Skin lesions	5	5.1%
Total	98	100%

Table 2: Incidence of Different Neoplastic Head and Neck Lesions by Age Group (n=98)

Age Group	Lymph Node	Thyroid	Salivary Gland	Soft Tissue	Skin	Total

0–10	0	0	0	0	0	0
11–20	1	1	1	1	0	4
21–30	5	1	2	3	0	11
31–40	6	3	8	3	1	21
41–50	4	5	2	4	1	16
51–60	9	2	4	3	1	19
61–70	7	2	3	2	1	15
71–80	6	1	2	1	1	11
81–90	0	1	0	0	0	1
>91	0	0	0	0	0	0
Total	38	16	22	17	5	98

Table 3: Incidence of Different Lymph Node Lesions (n=38)

Lymph Node Lesions	**No. of Cases**	**Incidence Rate (%)**
Metastatic Squamous Cell Carcinoma	20	52.6%
Non-Hodgkin's Lymphoma	4	10.5%
Hodgkin's Lymphoma	2	5.3%
Metastatic Poorly Differentiated Carcinoma	6	15.8%
Metastatic Adenocarcinoma	4	10.5%
Metastatic Nasopharyngeal Carcinoma	2	5.3%
Total	38	100%

Table 4: Incidence of Different Thyroid Lesions (n=16)

Thyroid Lesions	No. of Cases	Incidence Rate (%)
Follicular Lesion of Undetermined Significance	1	6.3%
Follicular Neoplasm	5	31.3%
Papillary Carcinoma	9	56.3%
Medullary Carcinoma	1	6.3%
Total	16	100%

Table 5: Incidence of Different Salivary Gland Lesions (n=22)

Salivary Gland Lesions	No. of Cases	Incidence Rate (%)
Pleomorphic Adenoma	15	68.2%
Warthin's Tumour	1	4.5%
Mucoepidermoid Carcinoma	5	22.7%
Adenocarcinoma	1	4.5%
Total	22	100%

Table 6: Incidence of Different Soft Tissue Lesions (n=17)

Soft Tissue Lesions	No. of Cases	Incidence Rate (%)
Lipoma	16	94.1%
Benign Spindle Cell Lesions	1	5.9%
Total	17	100%

Table 7: Incidence of Different Skin Lesions (n=5)

Skin Lesions	No. of Cases	Incidence Rate (%)

Benign Skin Adnexal Tumor	1	20%
Squamous Cell Carcinoma	4	80%
Total	5	100%

Discussion

Fine Needle Aspiration Cytology (FNAC) continues to be a pivotal tool in the diagnostic work-up of neoplastic lesions of the head and neck, especially in resource-limited settings. In this study of 98 cases over a one-year period, FNAC provided rapid and reliable diagnosis across various anatomical sites. The findings reinforce their diagnostic value in identifying the type and frequency of neoplastic pathologies in this anatomically complex region.

The highest proportion of lesions was observed in the lymph nodes (38.8%), consistent with global trends where secondary metastasis, especially from squamous cell carcinoma, remains the most common etiology of lymphadenopathy in the head and neck region [11]. Metastatic squamous cell carcinoma alone accounted for over half (52.6%) of the lymph node lesions, indicating its aggressive nature and the commonality of head and neck malignancies such as oral and oropharyngeal carcinomas. These findings are particularly significant in regions with high tobacco and alcohol consumption, which are well-known risk factors [12].

Thyroid lesions represented 16.3% of cases, with papillary carcinoma being the most frequent histological type (56.3%). This aligns with several recent studies indicating a global increase in papillary thyroid carcinoma, possibly due to enhanced diagnostic techniques and widespread use of ultrasound-guided FNAC [13]. The identification of follicular neoplasms also underscores the importance of cytological subtyping in therapeutic planning, as their management significantly differs from papillary types.

Salivary gland neoplasms comprised 22.4% of the study population, and among these, pleomorphic adenoma was the most common entity (68.2%), followed by mucoepidermoid carcinoma (22.7%). This distribution agrees with recent literature, which highlights pleomorphic adenoma as the most prevalent benign tumor of the salivary glands and mucoepidermoid carcinoma as the most common malignant counterpart [14].

Soft tissue neoplasms (17.3%) were predominantly lipomas, indicating their benign nature and slow-growing clinical course. The utility of FNAC in such cases is noteworthy, as it can reliably exclude malignancy and thus avoid unnecessary surgical procedures. Similarly, skin lesions accounted for 5.1% of cases, with squamous cell carcinoma dominating the findings. FNAC proves especially beneficial in these lesions due to its minimally invasive nature and rapid turnaround time [15].

The age distribution pattern in this study revealed that the majority of lesions occurred between the ages of 31 and 60 years, which corresponds to the age of peak occupational exposure and lifestyle-related risk factors. The relatively lower incidence in pediatric and geriatric populations may reflect both biological behavior and healthcare-seeking patterns.

Overall, this study validates FNAC as an essential diagnostic modality for early detection and classification of neoplastic head and neck lesions. Despite limitations such as occasional non-diagnostic smears or the inability to provide detailed architectural patterns, FNAC remains a frontline tool in cytopathological practice.

Conclusion

This retrospective analysis demonstrates the critical role of FNAC in the diagnosis of neoplastic lesions of the head and neck. The most common site was lymph nodes, with metastatic squamous cell carcinoma being the predominant lesion. FNAC effectively identified a spectrum of benign

and malignant conditions across thyroid, salivary glands, soft tissues, and skin. The technique remains indispensable due to its affordability, safety, and diagnostic precision. Integration of FNAC with clinical and radiological assessment enhances its accuracy and helps streamline patient management in both primary and tertiary care settings.

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